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**Urban Consumer Expenditure
and
the Consumption Function**

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URBAN CONSUMER EXPENDITURE AND THE CONSUMPTION FUNCTION

Planning for economic development usually involves the establishment of a national income accounting system at a relatively high level of aggregation. Included in such an income accounting system is a set of behavioural equations, and included in this set is almost always a consumption function. Consumption, the major component of aggregative demand, is usually linked to income and possibly other variables as well.¹ The purpose of this monograph is to study the behaviour of consumption among certain groups of income recipients in the Karachi urban area.

The consumption function as originally formulated by Keynes was employed chiefly to compute the "multiplier". Keynes was interested in the multiplier as a means of determining what level of autonomous spending would be required to bring a less than fully employed economy up to full employment. In the context of planning for development our interest is somewhat reversed. We are concerned with the extent to which autonomous injections—*e.g.* development expenditures—will result in inflationary pressures. To do this we need to know to what extent these autonomous injections result in induced expenditures. Chief among the latter is consumption. In measuring the extent to which development outlays can be safely carried—*i.e.* without inflationary consequences—we must know the extent to which increased consumption will be induced. In short, we must know something about the consumption function.

The *Second Five Year Plan* of Pakistan states (p. 29) that "it is difficult to obtain a reliable estimate of domestic savings when direct information is lacking about aggregate consumption." As a reasonable target the *Second Five Year Plan* (p. 29) suggests a marginal propensity

¹. For further discussion of planning methodology see J.C.H. Fei and Gustav Ranis, *The Methodology of Planning with Special Reference to Pakistan's Second Five Year Plan*, Monograph No. 1, Institute of Development Economics, Karachi, 1960.

to save of about .15. But this target figure did not emerge from a systematic attempt to compute a saving function largely because the data were not available. It is the aim of this monograph to make a modest contribution to overcoming this lack of information, and to provide data with which further studies of consumption may be carried on.

Section I briefly describes the data that we have used. Section II develops the consumption theory and statistical technique underlying our procedure. Section III examines various disaggregated forms of the consumption function and Section IV is a brief conclusion.

I. THE DATA

The basic data are presented in Tables 1, 2, and 3. These data are a by-product of the Institute's sample survey of 530 industrial establishments in Karachi.² Income and expenditure data on 510 workers and 326 small scale entrepreneurial households were collected.

A description of the survey and an appraisal of the quality of the data are given in some detail in the monograph referred to in footnote 2. It is sufficient to point out here that our data on consumption expenditure and income are believed to be reasonably accurate, in the sense that they represent actual money income received and expenditures paid out during the course of a year. It is also believed that the sampling procedures employed in gathering the data permit the application of commonly used statistical arguments to the interpretation of the results of our computations. The reader interested in further details is invited to consult the monograph referred to in footnote 2. In the meantime he is asked to appraise the analysis on the assumption that the data meet the above requirements.

II. THE AGGREGATIVE CONSUMPTION FUNCTION

The purpose of this section is to estimate an aggregative consumption function for the Karachi urban area.

². Gustav Ranis, *Industrial Efficiency and Economic Growth: A Case Study of Karachi*, Monograph No. 5, Institute of Development Economics, Karachi, 1961.

Theoretical Formulation

Let \bar{C} be the annual consumption expenditure (measured in 1,000's of rupees) of a family with an annual income of \bar{Y} (where \bar{Y} is also measured in 1,000's of rupees).³ Values for \bar{C} and \bar{Y} obtained from Table 1 were plotted in a scatter diagram, and by observation it was concluded that a parabolic regression curve of the form $\bar{C} = K_1 + K_2 \bar{Y} + K_3 \bar{Y}^2$ was the most appropriate description of the relationship between the two series. Such a curve was fitted to the data by the least squares method. (See Figure 1, Appendix). This computed regression equation is

$$(1) \quad \bar{C} = -.037 + 1.079\bar{Y} - .047\bar{Y}^2$$

Inspection of this regression curve superimposed on the scatter diagram suggests that it is a reasonably good fit, *i.e.*, it is a reasonably good description of the average relationship between \bar{C} and \bar{Y} for the data.

The more formal methods of measuring closeness of fit supports this observation. The coefficient of multiple correlation, R , between \bar{C} and \bar{Y} , \bar{Y}^2 is .9844, and R^2 is .9689. This means that 96.89 per cent of the variation in \bar{C} from its mean value can be explained by variation in \bar{Y} and \bar{Y}^2 . Equivalently, only $100 - 96.89 = 3.11$ per cent of the variation in \bar{C} from its mean cannot be accounted for by the variables included in Equation 1. Traditional consumption theory suggests other relevant variables to be assets of households, liquidity of households, average household size, and possibly the rate of interest. These variables must be ignored here because of the lack of data.

The standard errors of K_2 and K_3 are .0788 and .0070. Both K_2 and K_3 are significantly different from zero at the 1 per cent level of significance. Or we may say that the 99 per cent confidence interval for K_2 is .8830 to 1.273 and for K_3 it is $-.065$ to $-.029$. Neither interval contains zero, so we may be "pretty confident" that both K_2 and K_3 for the total population from which our sample was drawn are different from zero.⁴

³. Measurement in 1,000's of rupees is to simplify computations, and is done throughout the monograph. If $\bar{Y} = 400$ then conversion to 1,000's of rupees yields .4.

⁴. The usual statement is as follows: if we took many samples of size 836 items, computed K_2 and K_3 and their 99 per cent confidence intervals for each sample, then 99 out of every 100 such intervals would contain the (unknown) population value for K_2 and K_3 . The fact that zero is not in either interval then means that we are entitled to feel "quite confident" that K_2 and K_3 are significantly different from zero, *i.e.*, the population value of K_2 and K_3 are different from zero.

Similarly the standard error of K_1 was found to be .059. It is evident at once that the value of K_1 in Equation 1 is not significantly different from zero. The 99 per cent confidence interval is $-.1892$ to $.1152$. This means that our test does not entitle us to say that K_1 is not zero, *i.e.* does not entitle us to say that the regression curve does not go through the origin, *i.e.* is not homogenous.⁵

These results may be summarized as follows:

$$R^2 = .9689$$

K_1 :SE=.059, not significantly different from zero
(SE=standard error)

K_2 :SE=.078, significantly different from zero.

K_3 :SE=.077, significantly different from zero.

In later sections we will simply present a like summary of the statistical tests after each equation. Significance tests are in all cases at the 1 per cent level.

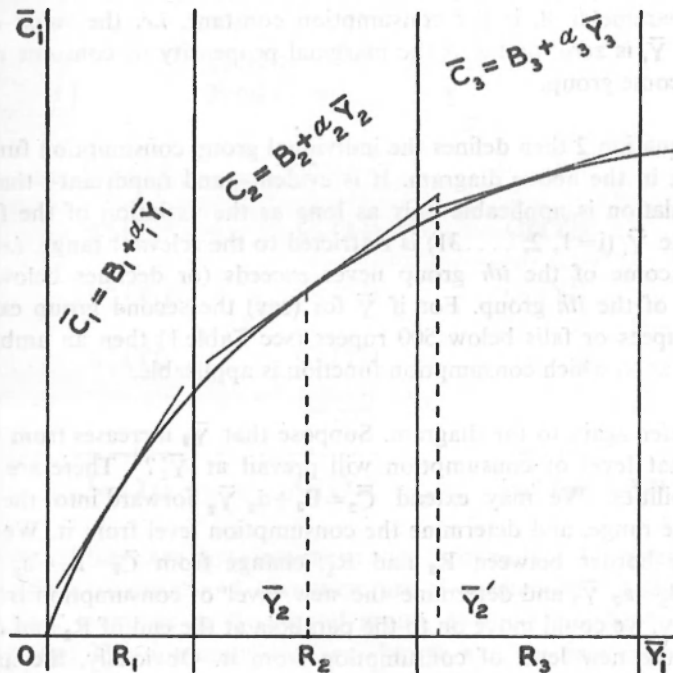
Is Equation 1 the consumption function for which we are searching? The answer depends (of course) upon what theory of consumption one adopts, but it seems unlikely that Equation 1 is the best that can be done. To use this equation as the consumption function implies that as households now earning a very low income move into higher brackets, they will consume at the same rate as persons now in the higher income group. This seems unlikely for several reasons. Households in lower income groups usually have a higher marginal propensity to consume than those in higher income groups. Indeed this is what Equation 1 and Figure 1 in the Appendix say. Therefore much depends on the distribution of the increments of income among the several income groups.

But it also is likely that as income rises for all income groups, the lower income groups will not emulate their currently wealthier neighbours, but will consume more than the latter group now consumes. This seems likely because consumption expenditures probably depend

⁵. Snedecor's F test of the linearity hypothesis leads to rejection at the 1 per cent level of significance. This further supports the use of the parabolic regression equation in describing the relationship between c and γ . For a description of this test (and all others used here) see any recent statistics textbook.

upon relative income as well as on the absolute level of income. There are other considerations as well including long run vs. short run relationships, temporary vs. permanent increases in income, the availability and form of earning assets. These various matters we cannot go into here,⁶ but we do reject Equation 1 as the consumption function because it does not appropriately weight the changes in income. An alternative consumption theory and statistical method is now considered.

The data available have been put into the form of a frequency distribution in Table 1. Each income group is assumed to have its own consumption function, and the aggregative function is then to be derived as a weighted sum of these individual functions. This approach is illustrated in the following diagram.



The R_1, R_2, R_3 intervals are illustrations of the income categories. The line drawn tangential to the parabola within each income bracket is assumed to be the consumption function for that particular income bracket. The parabola is the equation already derived. To add up these

⁶ The literature on the consumption function is enormous. See in particular the works of James S. Duesenberry, Milton Friedman, and Alvin H. Hansen.

individual functions several rather far reaching assumptions are necessary.

Assumption One: All households within each income group behave in the same fashion according to the function defined for that group. In the diagram these functions are straight lines, *i.e.* they are linear functions with a positive intercept with the vertical axis. Thus they all have the form

$$2) C_i = B_i + a_i Y_i$$

The subscript “*i*” refers to an individual income group. There are 31 income groups in the frequency distribution so “*i*” extends from 1 to 31. The parameter B_i is the consumption constant, *i.e.* the value of C_i when Y_i is zero, and a_i is the marginal propensity to consume of the *i*th income group.

Equation 2 then defines the individual group consumption function drawn in the above diagram. It is evident—and important—that this formulation is applicable only as long as the variation of the family income \bar{Y}_i ($i=1, 2, \dots, 31$) is restricted to the relevant range, *i.e.* that the income of the *i*th group never exceeds (or declines below) the limits of the *i*th group. For if \bar{Y} for (say) the second group exceeds 749 rupees or falls below 500 rupees (see Table 1) then an ambiguity arises as to which consumption function is applicable.

Refer again to the diagram. Suppose that \bar{Y}_1 increases from \bar{Y}_2 to \bar{Y}_2' what level of consumption will prevail at \bar{Y}_2' ? There are three possibilities. We may extend $\bar{C}_2 = B_2 + a_1 \bar{Y}_2$ forward into the next income range, and determine the consumption level from it. We may, at the border between R_2 and R_3 , change from $\bar{C}_2 = B_2 + a_2 \bar{Y}_2$ to $\bar{C}_3 = B_3 + a_3 \bar{Y}_3$ and determine the new level of consumption from it. Thirdly, we could move on to the parabola at the end of R_2 and determine the new level of consumption from it. Obviously, the answer would be different for all cases. What the most appropriate approach is cannot be ascertained without working out a rather detailed consumption theory, and this we cannot do within the confines of this monograph.

We shall employ assumption one throughout. It tells us that a family

will always react according to its income group's tangential consumption line. If this assumption is incorrect (if a family now with income \bar{Y}_2 enjoys an increase to \bar{Y}_2' and there emulates the families already at Y_2') our method will overestimate consumption. If the opposite change in \bar{Y}_2 takes place (it falls to R_1) and emulation again occurs, our method will yield an underestimation of consumption at that income. We may then conclude that our method is much more accurate for small fluctuations in income than for large and therefore open to serious question when large income changes are involved.

We must now seek to "aggregate" these individual consumption functions. The meaning of aggregation in this context can be explained with the aid of the following table of notations:

Total consumption, C			Total income, Y
<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>	
$C_1^1 (Y_1^1)$	$C_2^1 (Y_2^1)$	$C_3^1 (Y_3^1)$	
$C_1^2 (Y_1^2)$	$C_2^2 (Y_2^2)$	$C_3^2 (Y_3^2)$	
$C_1^3 (Y_1^3)$	$C_2^3 (Y_2^3)$		
	$C_2^4 (Y_2^4)$		
-----	-----	-----	Total C (Y)
$C_1 (Y_1)$	$C_2 (Y_2)$	$C_3 (Y_3)$	

Suppose that there are three income groups (groups 1, 2, 3, represented by the three columns) and that there are *three* members in the first group, four members in the second group, and two members in the third group. The consumption expenditures and the income of the individual members are denoted by C_i^j and Y_i^j respectively. In these notations, the superscript "j" identifies the individual members and the subscript "i" identifies the income group. The total consumption and income of all the members in an income group are denoted by C_i and Y_i respectively. Finally the total income and consumption of all members in all groups are denoted by C and Y respectively.

The significance of an “aggregated consumption function” is that it shows the total consumption, C , out of each level of *total* income, Y . Since we have postulated individuals consumption function in assumption one (which show a relation between C_i^j and Y_i^j) we must derive the aggregate consumption function from the individual consumption functions. This derivation procedure is called aggregation.

First of all let us systematically write down all the accounting relations implied by the above table of notations.

$$\begin{aligned} 3a) \quad & C_1 = C_1^1 + C_1^2 + C_1^3; \quad C_2 = C_2^1 + C_2^2 + C_2^3 + C_2^4; \quad C_3 = C_3^1 + C_3^2 \\ b) \quad & Y_1 = Y_1^1 + Y_1^2 + Y_1^3; \quad Y_2 = Y_2^1 + Y_2^2 + Y_2^3 + Y_2^4; \quad Y_3 = Y_3^1 + Y_3^2 \\ c) \quad & C = C_1 + C_2 + C_3 \\ d) \quad & Y = Y_1 + Y_2 + Y_3 \end{aligned}$$

Next, the assumption of the individual consumption function (assumption one) implies the following consumption behaviour for all individual members:

$$\begin{aligned} 4a) \quad & C_1^1 = B_1 + a_1 Y_1^1; \quad C_1^2 = B_1 + a_1 Y_1^2; \quad C_1^3 = B_1 + a_1 Y_1^3 \\ b) \quad & C_2^1 = B_2 + a_2 Y_2^1; \quad C_2^2 = B_2 + a_2 Y_2^2; \quad \dots; \quad C_2^4 = B_2 + a_2 Y_2^4 \\ c) \quad & C_3^1 = B_3 + a_3 Y_3^1; \quad C_3^2 = B_3 + a_3 Y_3^2 \end{aligned}$$

If we substitute these relations in 3a we have

$$\begin{aligned} C &= 3B_1 + a_1 (Y_1^1 + Y_1^2 + Y_1^3) \\ C_2 &= 4B_2 + a_2 (Y_2^1 + Y_2^2 + Y_2^3 + Y_2^4) \\ C_3 &= 2B_3 + a_3 (Y_3^1 + Y_3^2) \end{aligned}$$

We now add the above equations making use of 3b and 3c to simplify the notation:

$$C = (3B_1 + 4B_2 + 2B_3) + (a_1 Y_1 + a_2 Y_2 + a_3 Y_3)$$

Now if we assume that there are “ r ” income groups (instead of three) and the number of families in these income groups is N_i ($i=1, 2, \dots, r$) an obvious generalization of the above formula is

$$5) \quad C = (N_1 B_1 + N_2 B_2 + \dots + N_r B_r) + (a_1 Y_1 + a_2 Y_2 + \dots + a_r Y_r)$$

It follows immediately from this equation that we can derive the

aggregate consumption function if we know how total income Y (which does not appear in formula 5) is distributed to the individual groups, (*i.e.* how Y is divided into Y_1, Y_2, \dots, Y_r).⁷ We then make the following assumption:

Assumption Two: Total income, Y , is distributed to the various income groups in such a way that any particular income group always receives a constant proportion of total income.

Let w_i be the fraction of total income that goes to the *i*th group. These fractions w_1, w_2, \dots, w_r form a “system of weights” as they satisfy the following conditions.

- 6a) $w_i \geq 0$ (for all w_i)
- b) $w_1 + w_2 + \dots + w_r = 1$

Both are intuitively evident. Expression 6a says simply that no group receives a negative income (although some group may receive zero income) and 6b asserts that all income is divided among the r groups. (In our tables $r=31$.) Assumption two tells us that the income received by an income group can be computed as:

$$7) Y_1 = w_1 Y; Y_2 = w_2 Y; \dots; Y_r = w_r Y$$

When these equations are substituted in Equation 5 we have

- 8a) $C = B + aY$ where
- b) $B = N_1 B_1 + N_2 B_2 + \dots + N_r B_r$
- c) $a = a_1 w_1 + a_2 w_2 + \dots + a_r w_r$

Expression 8a is then our aggregated consumption function for the urban area. In this expression, “ B ” is the consumption constant and “ a ” is the marginal propensity to consume.

⁷. Intuitively one would expect that in the aggregation process one needs to know how group income Y_i is distributed to the individual members of the same group. Equation 5 implies that this knowledge is not necessary. This simplicity is basically due to the fact that the marginal propensities to consume for all the individuals consumption functions for members of the same group are the same (assumption one). It follows that the group consumption expenditure, C_i , is quite independent of how the total group income, Y_i , is distributed to the individual members.

It should be noted that the aggregative marginal propensity to consume "a" depends only on a_i and w_i and not on the number of families in the group. The consumption constant "B", however, depends upon the B_i 's and on the number of families in the i th group. This is an intuitively obvious result, given our assumptions. The total amount of consumption at zero level of income would depend very much on the total number of families as well as on the individual family's B. The increment in consumption occurring as a result of an increment in income however is dependent upon how much of the increment of income accrues to a given group (w_i) and that group's marginal propensity to consume (a_i). It is the amount of income accruing to the group that is relevant, and not the number of families.

Attention is directed toward the importance of assumption two. If income distribution changes as income increases then we cannot derive expressions 8a and 8b in the fashion in which we have. But there are other hypotheses as to income distribution that, in a developing economy, are of interest. For example, we might investigate a situation in which each income group received the same absolute increment of income. In this case the w 's of the lower income groups would rise relative to those of the higher income groups. One might also assume that an effort is made to increase the income of the lowest 10 per cent of the income recipients and see what happens to consumption. These additional hypotheses as to income distribution cannot be investigated here. The reason for noting them at this point is to emphasize the limiting nature of our assumptions and that other assumptions of equal validity could be made.

Statistical Implementation

The statistical implementation of the above theoretical formulation requires an estimation of parameters a_i and b_i of the i th ($i=1, 2, \dots, 31$) group consumption function, the income distribution coefficients w_i , and the number of families in each income group, N_i .

The parameters a_i and b_i can be estimated with the aid of equation 1 our original parabolic regression curve of the relationship between \bar{C}_i and Y_i . Refer again to the diagram in the text above. We can imagine that the parabola is formed of short segments of straight lines which are, in fact, the linear family consumption functions of the individual

income groups.⁸ On this assumption we must first derive an expression for the slope of the parabolic curve at each group income level, defined by equation 1. Elementary calculus tells us that the slope of a curve is found by taking the first derivative of the expression that defines the curve. In the case of Equation 1 this is a simple matter.⁹ It is

$$\frac{d\bar{C}}{d\bar{Y}} = 1.079 - .094 \bar{Y}$$

The slope tells us the extent to which average consumption will change given a small change in average income, and this by definition is the marginal propensity to consume. It is thus the a_i of Equation 2 at the given level of \bar{Y} . Thus we may write

$$9) a_i = 1.079 - .094 \bar{Y}_i$$

and for each \bar{Y} we may compute the corresponding a_i . For each \bar{Y} we may also compute the \bar{C} from the parabola, Equation 1. If we compute the a_i and \bar{C}_i and are given the \bar{Y}_i , we may substitute their values into Equation 2 and derive the value of B_i as a residual. In this fashion then we are able to obtain estimates of Equation 2. But Equation 2 is the consumption function for an individual income group, and now the problem is to obtain the weighted sum of these group functions as the aggregative consumption function. To do this we have already shown that we need estimates of w_i , the income distribution coefficient and N_i , the number of families in the i th group.

We have no independent knowledge of income distribution in Karachi or Pakistan from which to estimate w_i and must therefore use data from the sample. Let the number of families in the i th income group of the sample be denoted by n_i . (This should not be confused with N_i , the weight of the B_i , which is the number of families in the total population in the i th income group.) Then the total income received by the i th income group is $n_i \bar{Y}_i$ ($i=1, 2, \dots, 31$) and the

⁸. In other words, we assume that the parabola can be approximated linearly in a small neighbourhood. Furthermore this approximately linear relation describes the consumption pattern of a given income group.

⁹. Expression 1 is of the form $\bar{C} = K_1 + K_2 \bar{Y} + K_3 \bar{Y}^2$ and its first derivative is $\frac{d\bar{C}}{d\bar{Y}} = K_2 + 2K_3 \bar{Y}$.

income received by all the families in all income groups is $n_1 \bar{Y}_1 + n_2 \bar{Y}_2 + \dots + n_{31} \bar{Y}_{31}$. The distribution coefficient, w_i , is then approximated by

$$10) w_i = \frac{n_i \bar{Y}_i}{n_1 \bar{Y}_1 + n_2 \bar{Y}_2 + \dots + n_{31} \bar{Y}_{31}} \quad (i=1, 2, \dots, 31)$$

which states simply that w_i is the proportion of total income earned by the *i*th income group computed from the sample data. It is therefore an approximation to the w_i for the entire population. From Equation 8c it is a matter of simple arithmetic to compute a , the marginal propensity to consume for the entire population. Its value is .76.

For the estimation of the consumption constant, B , Equation 8b tells us that we must obtain an estimate of N_i , the number of families in the *i*th income group in the total population. If we know the total number of families, N , in the Karachi urban area, and if we assume that the number of families in each income group, N_i , is always a fixed proportion of N then as an approximation to N_i we may write:

$$11) N_i = \left(\frac{n_i}{n_1 + n_2 + \dots + n_{31}} \right) N \quad (i=1, 2, \dots, 31)$$

In other words we may estimate N_i by using the proportionality factors ($n_i / \sum n_i$) prevailing in the sample. Based on this formulation the expression for the consumption constant, B (Equation 8a), becomes

$$\begin{aligned} B &= B_1 \left(\frac{n_1}{n_1 + n_2 + \dots + n_{31}} N \right) + B_2 \left(\frac{n_2}{n_1 + n_2 + \dots + n_{31}} N \right) + \dots \\ &= \frac{B_1 n_1}{n_1 + n_2 + \dots + n_{31}} N + \frac{B_2 n_2}{n_1 + n_2 + \dots + n_{31}} N \end{aligned}$$

and, finally, combining terms, we may write

$$12) B = (B_1 n_1 + B_2 n_2 + \dots + B_{31} n_{31}) \frac{N}{n_1 + n_2 + \dots + n_{31}}$$

There are approximately 355,000 worker and entrepreneurial households in Karachi, and we take this figure for the value of N . With these assumptions (and note that Equation 11 depends on two very important if's) and estimates, the computation of B for Equation 8a is again a matter of arithmetic. It comes out to be 89,930.165. We now have the aggregative consumption function as

$$13) C = 89,930.156 + .76 Y \text{ (Figure 2, Appendix)}$$

There are two very important things to note about this function and the calculated values. In the first place it implies a particular theory of consumption. This was briefly referred to earlier. In the second place, it has been necessary in order to complete the calculations with the available data to make some assumptions that at best are approximations to reality. Chief among these are the assumptions concerning income distribution, the w_i , and the number and distribution of families, N and N_i . In appraising Equation 13 one should keep carefully in mind the nature of these assumptions and their strategic role in the argument.

For reasons to be discussed in the last section of the monograph however it is believed that our results are worth close study.

III. DISAGGREGATED CONSUMPTION FUNCTIONS

From the point of view of the overall pressure on resources, the aggregative consumption function is, of course, most relevant for planning. However specific demand pressures also need to be anticipated in order to appraise the consistency of the plan and the appropriateness of production targets.¹⁰ These specific demand pressures may be directed toward specific commodities or may be generated by specific income recipients. In this section of the monograph, we shall study in a limited way these specific demand pressures by deriving certain disaggregated consumption functions.

We separate total consumption into two categories, food and non-food, and we separate the total number of income recipients into two

¹⁰. "Research on patterns of consumption at different income levels is needed—for forecasts of demand—in planning production programmes and in measuring their effects of development on welfare." *Pakistan Second Five Year Plan* (p 120).

categories, “workers” and “small scale entrepreneurs”. The separation into these latter categories, as was noted earlier, was made possible by coverage of the sample survey. For the derivation of the disaggregated consumption function, we shall, in every case, employ the same method which we have used in deriving Equation 13. This procedure involved the following two steps:

Step One: Postulate a parabolic regression curve of the form $\bar{C} = K_1 + K_2Y + K_3Y^2$ and then estimate the parameters K_1 , K_2 , and K_3 by the method of the least squares. The variables, C and \bar{Y} , refer here to the relevant type of commodity (food and non-food) and the relevant type of income recipients (workers and entrepreneurs). Appropriate subscripts will be used in the equations.

Step Two: Derive the disaggregated consumption function from the parabolic regression curves in the same manner as for the aggregated case. Assumptions one, two, and three are again necessary and impose the same limitations and qualifications on our results as before. The necessary data are shown in Tables 1, 2, and 3.

As the method followed is the same as in the previous section, we will simply present a summary of the results.

A. Consumption of food (C_f) by all income recipients:

The equation of the parabola is

$$(14) \bar{C}_f = .018 + .668\bar{Y} - .036\bar{Y}^2 \text{ (Figure 3, Appendix)}$$

Here \bar{C}_f is average annual expenditure on food. (The reader is reminded that units are in 1,000's of rupees). The statistical calculations yield the following results:

$$R^2 = .9343$$

K_1 :SE = .046 not significantly different from zero.

K_2 :SE = .072 significantly different from zero

K_3 :SE = .007 significantly different from zero

The consumption function arrived at is

$$(15) C_f = 78,005.020 + .43Y \text{ (Figure 4, Appendix)}$$

B. Consumption of all non-food products C_o by all income recipients:

The parabola has been obtained directly as the difference between Equation 1 and Equation 14. This can be done because consumption of food plus non-food add up to total consumption. The resulting equation for this parabola is

$$(16) \bar{C}_o = -.055 + .411\bar{Y} - .011\bar{Y}^2 \text{ (Figure 5, Appendix)}$$

where \bar{C}_o is "other" consumption expenditures. Because Equation 16 is obtained by simple subtraction no statistical tests were applied. The consumption function is

$$(17) C_o = 8355.606 + .33Y \text{ (Figure 6, Appendix)}$$

Note that the marginal propensity to consume food (.43) is higher than the marginal propensity to consume all other products (.33). This is a reflection of the low level of income prevailing in Pakistan. For at very low levels of income, any increment of income will be spent to a large degree on food. As average income rises we would expect the marginal propensity to consume food to decline and that of "other products" to increase.

C. Overall consumption by entrepreneurs: The equation for the parabola is

$$(18) \bar{C} = .068 + 1.000\bar{Y}_E - .040\bar{Y}_E^2 \quad \left\{ \begin{array}{l} \bar{Y}_E \text{ is average income of entrepreneurs.} \\ \text{(Figure 7, Appendix)} \end{array} \right.$$

$$R^2 = .971$$

K_1 :SE=.056: not significantly different from zero

K_2 :SE=.075: significantly different from zero

K_3 :SE=.007: significantly different from zero

The entrepreneurial total consumption function is

$$(19) \quad C = 6,297.933 + .67Y_E \quad (\text{Figure 8, Appendix})$$

The marginal propensity to consume of entrepreneurs is thus well below that of workers and entrepreneur combined. This is to be expected for two reasons: entrepreneurs are generally in the higher income brackets and, in a static situation, individuals with higher incomes usually consume a smaller proportion of their incomes than those in lower income brackets. Secondly, entrepreneurs in general, irrespective of their income, have a greater propensity to save than workers. This is true almost by definition as entrepreneurs must usually save in order to remain entrepreneurs.

D. Entrepreneurial consumption of food: The equation for the parabola is

$$(20) \quad \bar{C}_f = .105 + .598 \bar{Y}_E - .029 \bar{Y}_E^2 \quad (\text{Figure 9, Appendix})$$

$$R^2 = .928$$

$$K_1 : SE = .047 \text{ not significantly different from zero}$$

$$K_2 : SE = .074 \text{ significantly different from zero}$$

$$K_3 : SE = .008 \text{ significantly different from zero}$$

And the entrepreneurial consumption function for food is

$$(21) \quad C_f = 4855.664 + .37 Y_E \quad (\text{Figure 10, Appendix})$$

The entrepreneur's marginal propensity to consume food is thus below that of the total of workers plus entrepreneur population. This again is in conformity with most theories of consumer behaviour.

E. Overall consumption of workers: In this case the parabola does not give a good fit and a linear relationship is indicated by the scatter. The equation for the linear function which emerges is:

$$(22) \quad \bar{C} = .049 + .904 \bar{Y}_w \quad (\text{Figure 11, Appendix})$$

Aggregation is very simple in this case since all B and a are equal. The result is

$$(23) \quad C = 11,902.113 + .90Y_w \quad (\text{Figure 12, Appendix})$$

The value .90 is higher than that for the merged population as a whole, and again this result conforms to our theoretical expectations.

F. Workers consumption of food: The equation for the parabola here (See Figure 13, Appendix) is

$$(24) \quad \bar{C}_f = -.1310 + .7597Y_w - .0405\bar{Y}_w^2$$

$$R^2 = .9732$$

K_1 :SE=.0318 significantly different from zero

K_2 :SE=.0805 significantly different from zero

K_3 :SE=.0123 significantly different from zero

The consumption function is

$$(25) \quad C_f = 27,962.960 + .53Y_w \quad (\text{See Figure 14, Appendix})$$

Again here our result—a higher marginal propensity to consume food for workers than for entrepreneurs—supports a view consistent with generally held views of consumer behaviour.

G. Consumption of “other commodities” by entrepreneurs and workers: The parabolas and consumption functions for these relationships can be obtained by subtraction of the appropriate food equation from the corresponding total consumption equation. This the interested reader may do for himself.

For reasons that have been mentioned we have more confidence in our estimates of the marginal propensities than for the consumption constant. We summarize our results with respect to the marginal propensities in the following chart.

$$(19) C = 6,297.933 + .67Y_E \quad (\text{Figure 8, Appendix})$$

The marginal propensity to consume of entrepreneurs is thus well below that of workers and entrepreneur combined. This is to be expected for two reasons: entrepreneurs are generally in the higher income brackets and, in a static situation, individuals with higher incomes usually consume a smaller proportion of their incomes than those in lower income brackets. Secondly, entrepreneurs in general, irrespective of their income, have a greater propensity to save than workers. This is true almost by definition as entrepreneurs must usually save in order to remain entrepreneurs.

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The value .90 is higher than that for the merged population as a whole, and again this result conforms to our theoretical expectations.

F. Workers consumption of food: The equation for the parabola here (See Figure 13, Appendix) is

$$(24) \bar{C}_t = -.1310 + .7597Y_w - .0405\bar{Y}_w^2$$

$$R^2 = .9732$$

K_1 :SE=.0318 significantly different from zero

K_2 :SE=.0805 significantly different from zero

K_3 :SE=.0123 significantly different from zero

The consumption function is

$$(25) C_t = 27,962.960 + .53Y_w \text{ (See Figure 14, Appendix)}$$

Again here our result—a higher marginal propensity to consume food for workers than for entrepreneurs—supports a view consistent with generally held views of consumer behaviour.

G. Consumption of “other commodities” by entrepreneurs and workers: The parabolas and consumption functions for these relationships can be obtained by subtraction of the appropriate food equation from the corresponding total consumption equation. This the interested reader may do for himself.

For reasons that have been mentioned we have more confidence in our estimates of the marginal propensities than for the consumption constant. We summarize our results with respect to the marginal propensities in the following chart.

Income Recipient	Consumption of		
	Food	Non-food	All Consumption
Worker	.53	.37	.90
Entrepreneur	.37	.30	.67
Total	.43	.33	.76

IV. CONCLUSION

This study has tried to shed some light on urban consumer behaviour in Pakistan. The rationale of the study was stated in the Introduction. The assumptions underlying the theory that was applied and the statistical procedure used have been explained in Sections II and III. It is evident that our results must be applied with a great deal of care. But this is not to say that our results are not important. Some things may be noted in particular.

The marginal propensities are, with one exception—workers' total consumption—surprisingly low. The aggregative consumption function computed in Section II is .76. A marginal propensity to save of .24 for the economy as a whole would be an extremely favourable conclusion but we should also remember that we are here dealing only with the urban population. We are not justified in suggesting that the Planning Commission target of a marginal propensity to save of .15 is overly pessimistic—especially when we note that the marginal propensity to save among workers is only .10. We are, however, justified in saying that for small, short-run increase in income total urban consumption can be appropriately described by Equation 13. For long periods (say greater than one year) and assuming sustained growth, it would be inappropriate to assume Equation 13 was valid. In this longer run both the income distribution assumption and the shape of the individual groups consumption function would have to be considered in great detail. There is no doubt that more complicated theory would be necessary.

One other important consequence of the study concerns its impli-

cations for further research. As already observed, the marginal propensities are surprisingly low even for the limited way in which we have defended their applicability. This unusual result suggests that additional statistical investigations into consumption may yield further surprises that will be of greater direct relevance to long run planning in Pakistan. The Institute hopes to do further studies in this area and invites others to use the data in Tables 1, 2 and 3 for their own research.



TABLE 1

URBAN HOUSEHOLD EXPENDITURE (Entrepreneurs and Workers Combined)

(1)	(2)	(3)	(4)	(5)	(6)
Income Group (In Rupees)	Average Yearly Income (In Rs.)	Average Yearly Expenditure (In Rs.)	Expenditure as a % of Yearly Income	Average Yearly Expenditure on Food (In Rs.)	Expenditure on Food as % of Year- ly Income
250—499	432.00	432.00	100.00	288.00	66.67
500—749	658.22	646.66	98.24	433.99	65.93
750—999	885.51	816.59	92.22	529.64	59.81
1000—1249	1160.15	1086.79	93.68	724.28	62.43
1250—1499	1390.57	1342.88	96.57	810.47	58.28
1500—1749	1574.11	1424.59	90.50	958.93	60.92
1750—1999	1841.11	1750.70	95.09	1055.83	57.35
2000—2249	2122.35	1916.71	90.31	1217.76	57.38
2250—2499	2386.17	2229.70	93.44	1411.72	59.16
2500—2749	2561.99	2390.95	93.32	1498.70	58.50
2750—2999	2795.05	2647.89	94.73	1630.00	58.32
3000—3249	3053.74	2735.36	89.57	1714.15	56.13
3250—3499	3371.50	2915.37	86.47	1865.71	60.00
3500—3749	3600.45	3401.40	94.47	2096.66	58.23
3750—3999	3871.53	3527.65	91.12	1964.70	50.75
4000—4249	4128.74	3644.16	88.26	2153.91	52.17
4250—4499	4323.20	4070.40	94.15	2628.00	60.79
4500—4749	4576.72	3967.64	86.69	2455.60	53.65
4750—4999	4824.67	4293.00	88.98	2613.33	54.17
5000—5499	5215.62	4675.23	89.64	2746.40	52.66
5500—5999	5697.67	4815.00	84.51	2587.50	45.41
6000—6499	6126.67	5148.00	84.03	2784.85	45.45
6500—6999	6758.66	4892.00	72.38	2800.00	41.43
7000—7499	7120.80	5480.00	76.97	2340.00	32.87
7500—7999	7600.00	5400.00	71.05	2360.00	31.05
8000—8499	8400.00	5550.00	66.07	2940.00	35.00
8500—8999	8500.00	5000.00	58.82	3380.00	39.76
9000—9499	9170.00	5145.00	56.11	3600.00	39.25
9500—9999	9600.00	5600.00	58.33	n.a.	n.a.
10000—10999	10000.00	6000.00	60.00	n.a.	n.a.
11000—11999	11000.00	7200.00	65.46	n.a.	n.a.

TABLE 2
URBAN HOUSEHOLD EXPENDITURE (Entrepreneurs only)

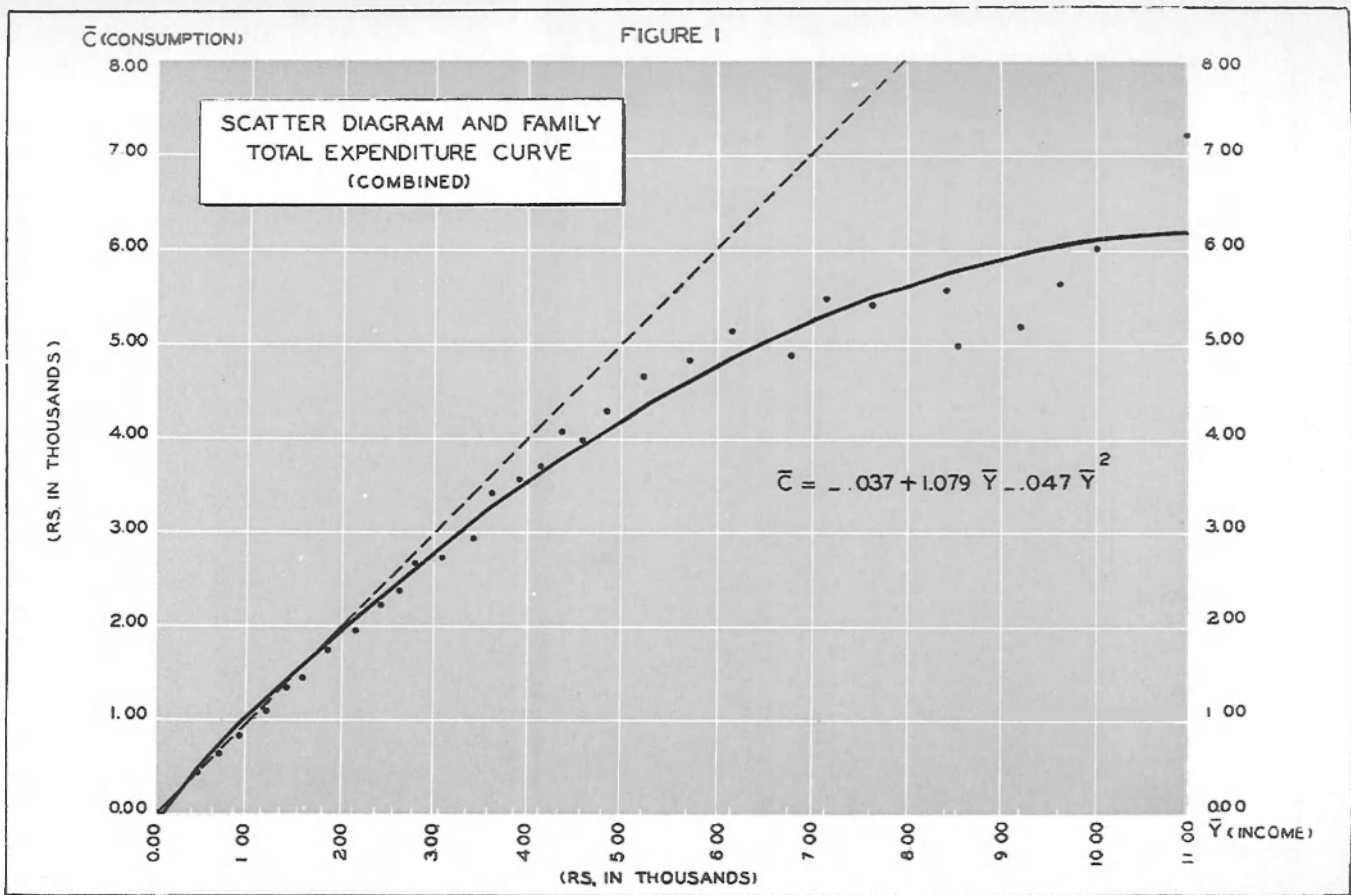
Income Group (In Rupees)	Average Yearly Income (In Rs.)	Average Yearly Expenditure (In Rs.)	Expenditure as a % of Yearly Income	Average Yearly Expenditure on Food (In Rs.)	Expenditure on Food as % of Yearly Income
250—499	480.00	480.00	100.00	300.00	62.50
500—749	678.00	660.00	97.19	444.00	65.49
750—999	876.36	806.89	92.07	575.60	65.68
1000—1249	1144.66	1113.00	97.23	715.00	62.46
1250—1499	1381.40	1354.40	98.05	874.75	63.32
1500—1749	1579.42	1523.07	96.43	972.72	61.59
1750—1999	1832.04	1749.66	95.50	1031.51	56.30
2000—2249	2131.90	1954.90	91.16	1238.75	58.10
2250—2499	2379.84	2247.34	94.43	1409.28	59.22
2500—2749	2519.41	2398.82	95.17	1440.00	57.16
2750—2999	2788.33	2646.66	94.95	1520.00	54.51
3000—3249	3047.63	2698.10	88.53	1703.75	55.90
3250—3499	3346.66	2646.66	79.08	1876.00	56.06
3500—3749	3626.21	3436.42	94.76	2160.00	59.57
3750—3999	3882.40	3332.40	85.83	1692.00	43.58
4000—4249	4096.71	3609.71	88.11	2144.60	52.35
4250—4499	4250.00	3900.00	91.76	2670.00	62.82
4500—4749	4600.66	3784.00	82.24	2160.00	46.95
4750—4999	4829.33	3996.00	82.74	2430.00	50.32
5000—5499	5220.00	4413.33	84.54	2578.18	49.39
5500—5999	5642.50	4705.00	83.38	2550.00	45.19
6000—6499	6084.00	4767.20	78.35	2544.00	41.81
6500—6999	6758.66	4892.00	72.38	2800.00	41.43
7000—7499	7120.80	5480.00	76.95	2340.00	32.86
7500—7999	7600.00	5400.00	71.05	2360.00	31.05
8000—8499	8400.00	5550.00	66.07	2940.00	35.00
8500—8999	8500.00	5000.00	58.82	3380.00	39.76
9000—9499	9170.00	5145.00	56.10	3600.00	39.26
9500—9999	9600.00	5600.00	58.33	n.a.	n.a.
10,000-10,999	10,000.00	6000.00	60.00	n.a.	n.a.
11,000-11,999	11,000.00	7200.00	65.45	n.a.	n.a.

TABLE 3
URBAN HOUSEHOLD EXPENDITURE (Workers Only)

Income Group (In Rupees)	Average Yearly Income (In Rs.)	Average Yearly Expenditure (In Rs.)	Expenditure as a % of Yearly Income	Average Yearly Expenditure on Food (In Rs.)	Expenditure on Food as % of Year- ly Income
250—499	420.00	420.00	100.00	284.00	67.62
500—749	654.78	644.34	98.40	431.99	65.97
750—999	889.75	821.09	92.28	512.40	57.7
1000—1249	1165.04	1078.51	92.57	726.98	62.40
1250—1499	1395.27	1336.97	95.82	783.41	56.15
1500—1749	1571.12	1368.93	87.13	952.04	60.60
1750—1999	1846.47	1751.32	94.84	1067.14	57.79
2000—2249	2118.01	1899.36	89.67	1209.95	57.13
2250—2499	2391.37	2215.22	92.63	1413.47	59.11
2500—2749	2596.47	2384.57	91.83	1543.42	59.44
2750—2999	2798.15	2648.46	94.65	1685.00	60.22
3000—3249	3058.39	2763.68	90.36	1720.80	56.26
3250—3499	3386.40	3076.60	90.85	1860.00	54.93
3500—3749	3577.14	3369.71	94.20	2051.42	57.35
3750—3999	3867.00	3609.00	93.32	2078.33	53.75
4000—4249	4173.60	3692.40	88.47	2166.00	51.90
4250—4499	4372.00	4184.00	95.69	2600.00	59.47
4500—4749	4548.00	4188.00	92.08	2751.20	60.49
4750—4999	4820.00	4590.00	95.22	2760.00	57.26
5000—5499	5209.77	5024.44	96.44	2952.00	56.66
5500—5999	5808.00	5032.00	86.63	2625.00	45.20
6000—6499	6157.14	5420.00	88.03	3025.71	49.14

APPENDIX

1. Scatter Diagram and Family Total Expenditure Curve (Combined)
2. Aggregate Consumption Function (Combined)
3. Scatter Diagram and Family Expenditure on Food Curve (Combined)
4. Aggregate Consumption Function for Food (Combined)
5. Scatter Diagram and Family Expenditure Curve (All Other Commodities)
6. Aggregate Consumption Function (All Other Commodities)
7. Scatter Diagram and Family Total Expenditure Curve (Entrepreneurs only)
8. Aggregate Consumption Function (Entrepreneurs only)
9. Scatter Diagram and Family Expenditure on Food Curve (Entrepreneurs only)
10. Aggregate Consumption Function for Food (Entrepreneurs only)
11. Scatter Diagram and Family Total Expenditure Curve (Workers only)
12. Aggregate Consumption Function (Workers only)
13. Scatter Diagram and Family Expenditure on Food Curve (Workers only)
14. Aggregate Consumption Function for Food (Workers only)



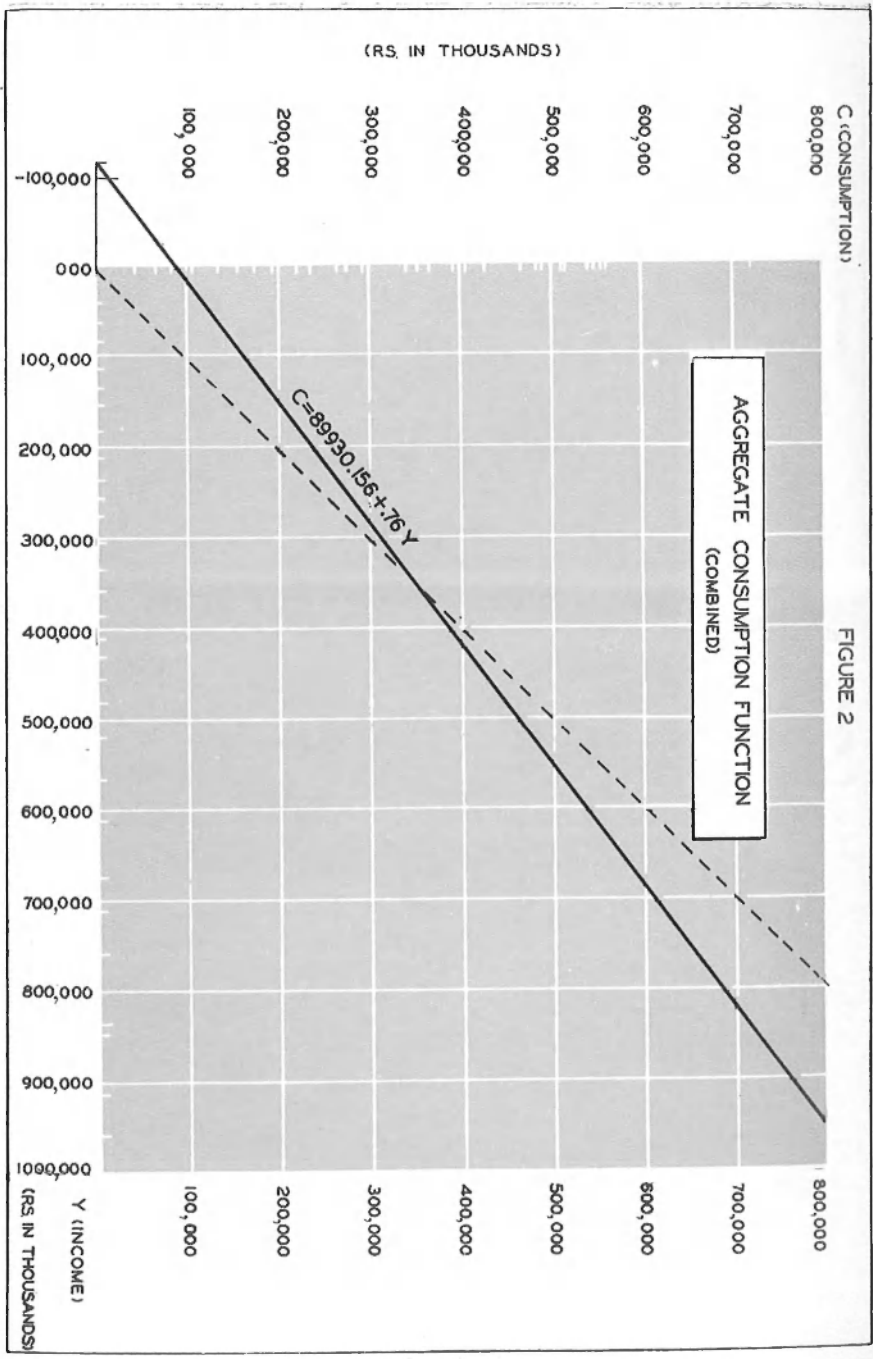


FIGURE 2

FIGURE 3

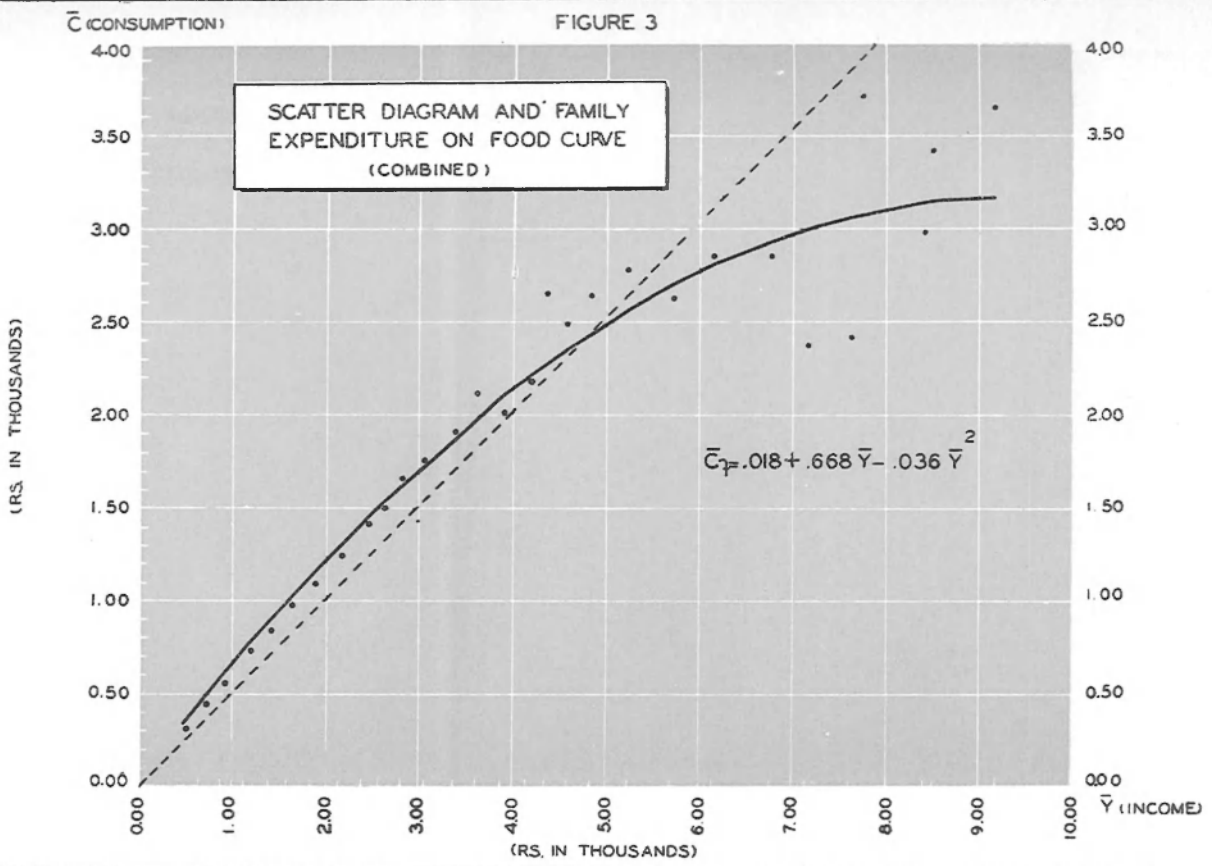


FIGURE 4

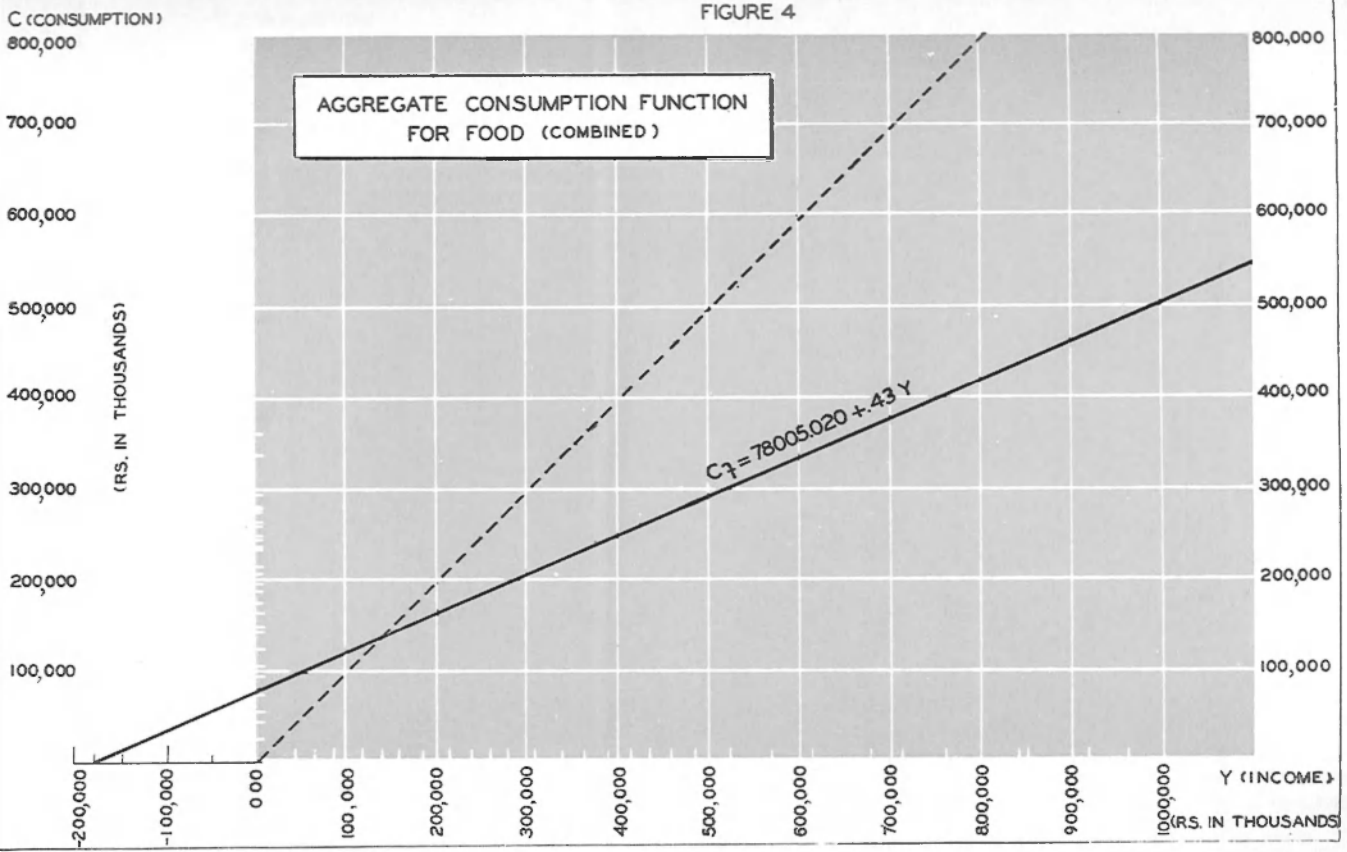


FIGURE 5

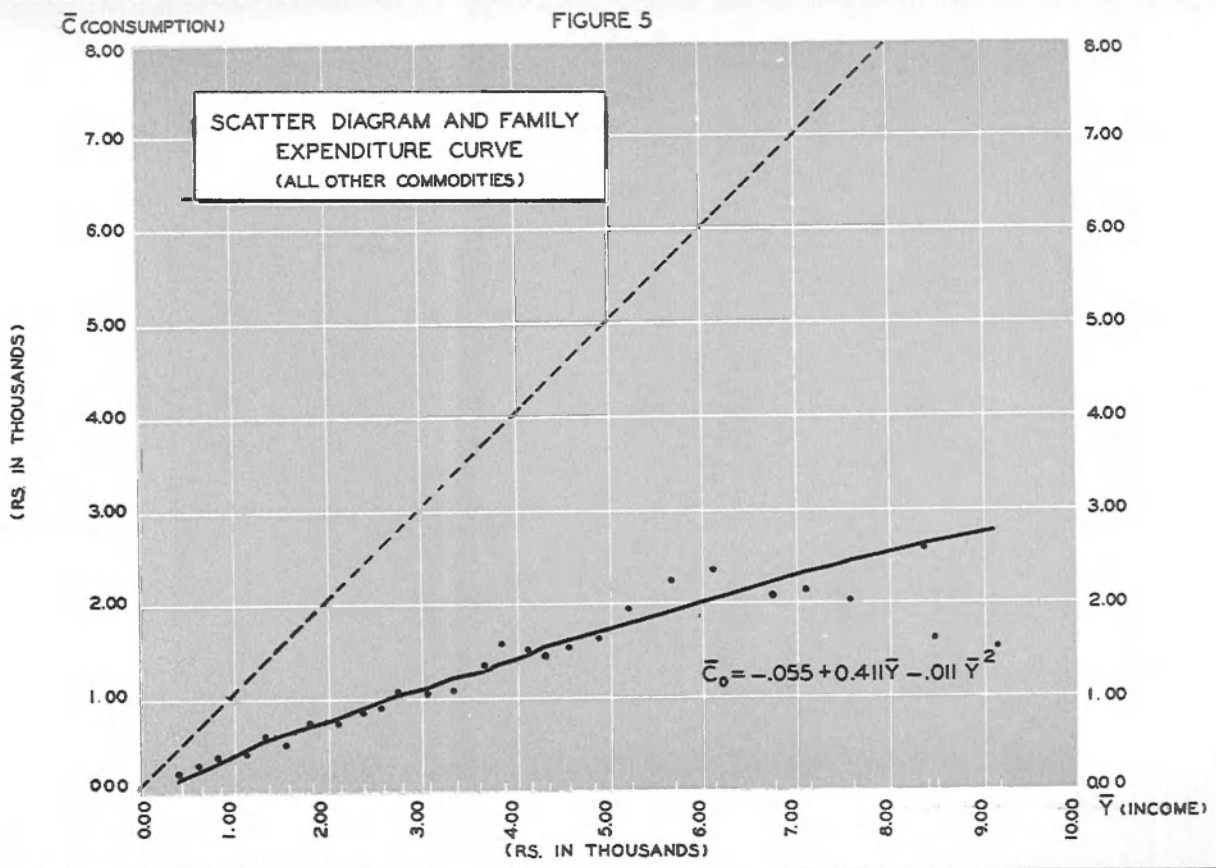


FIGURE 6

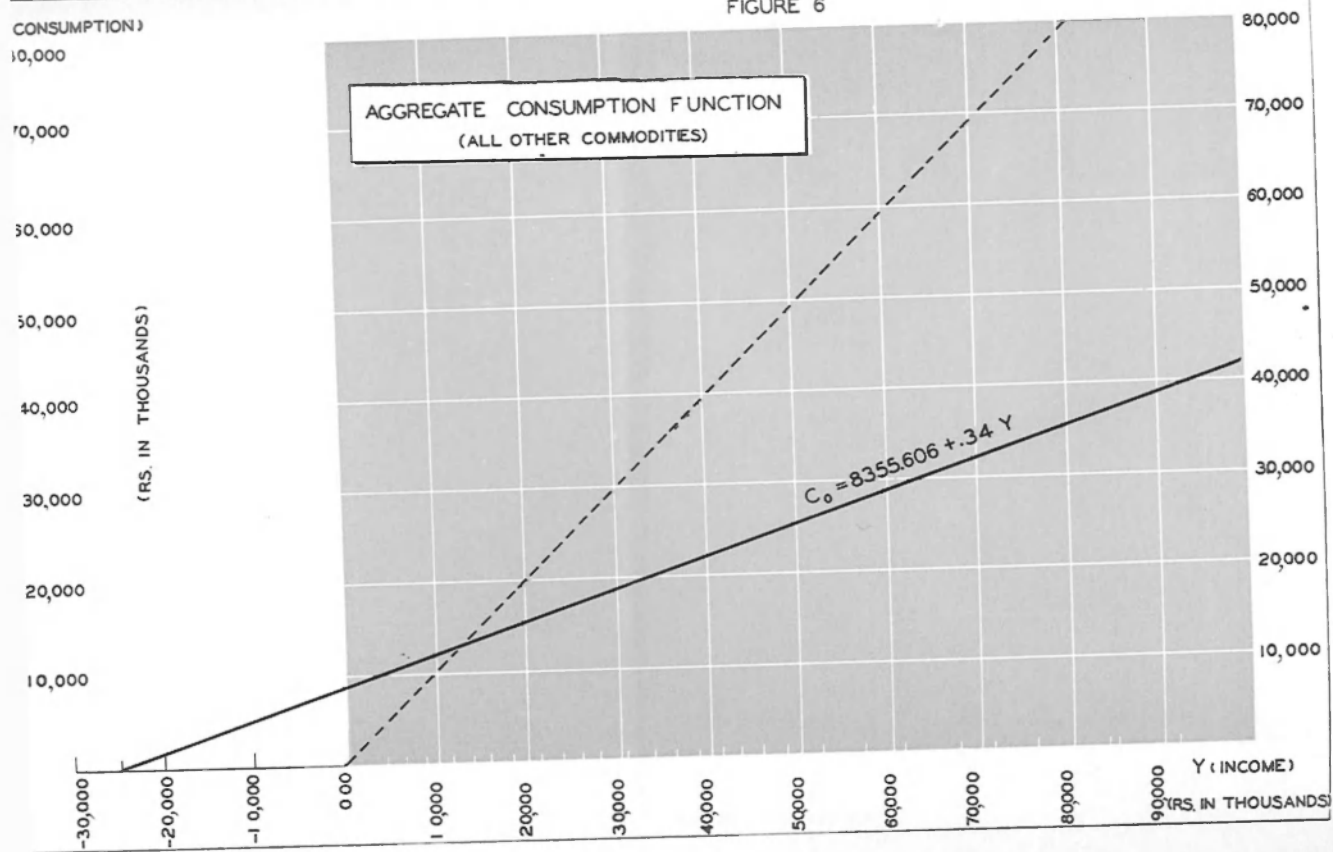


FIGURE 7

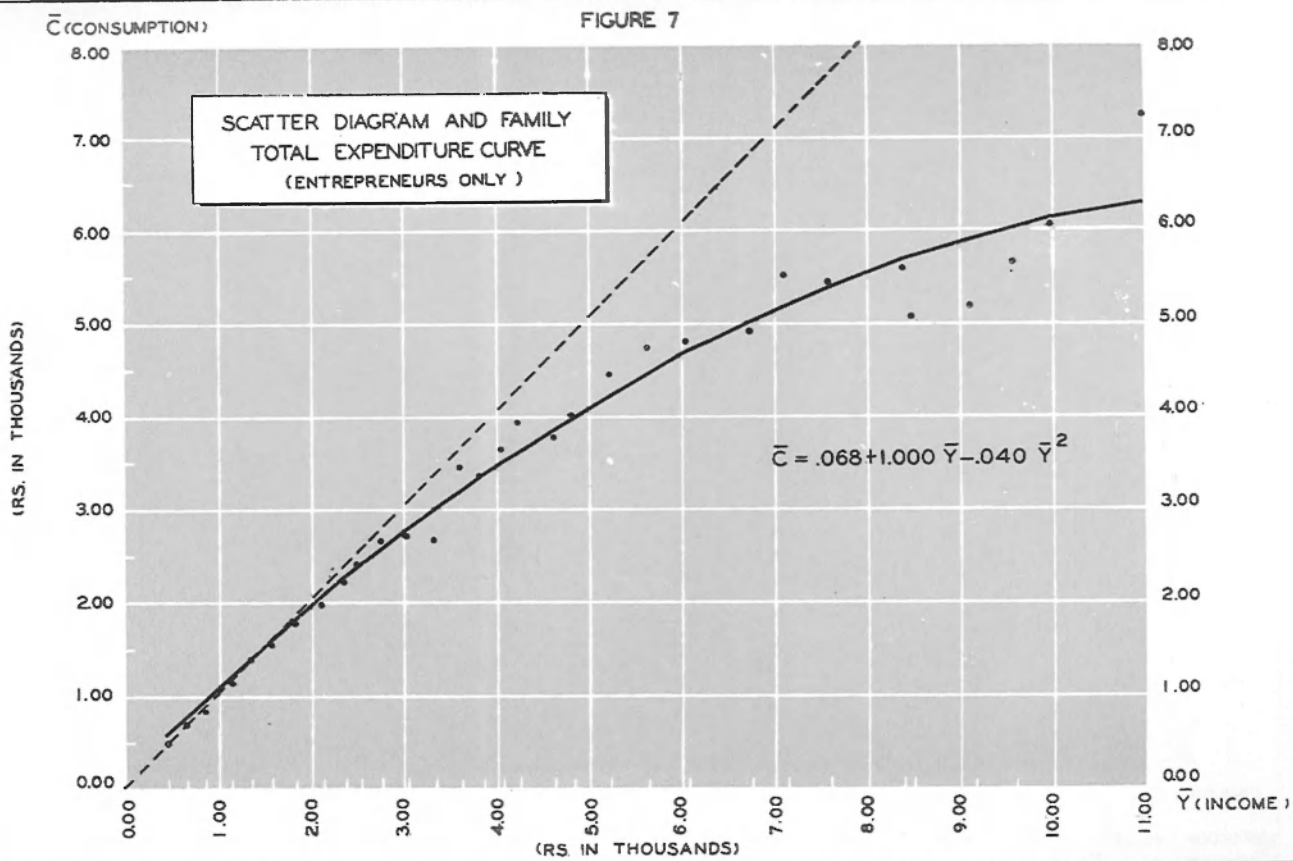


FIGURE 8

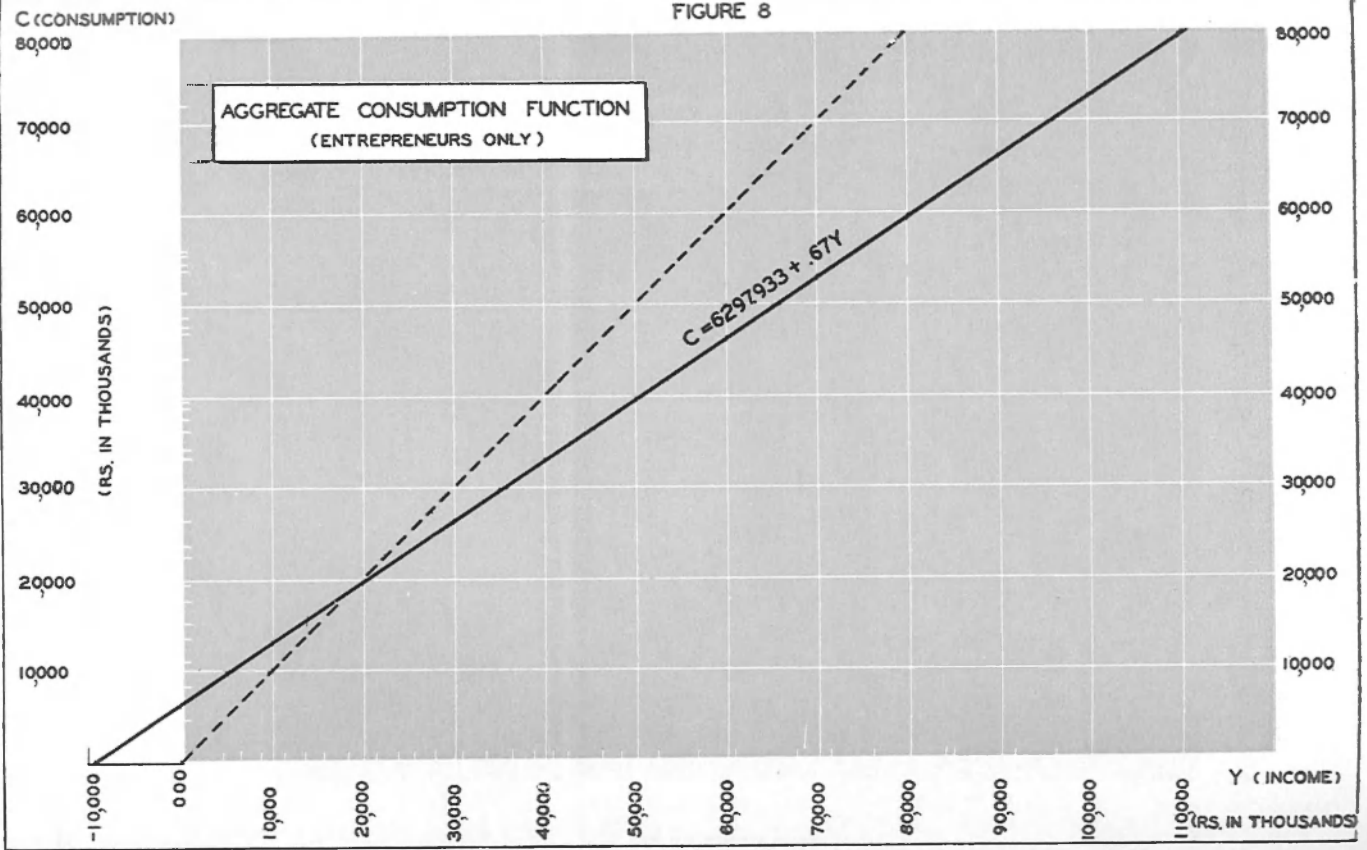


FIGURE 9

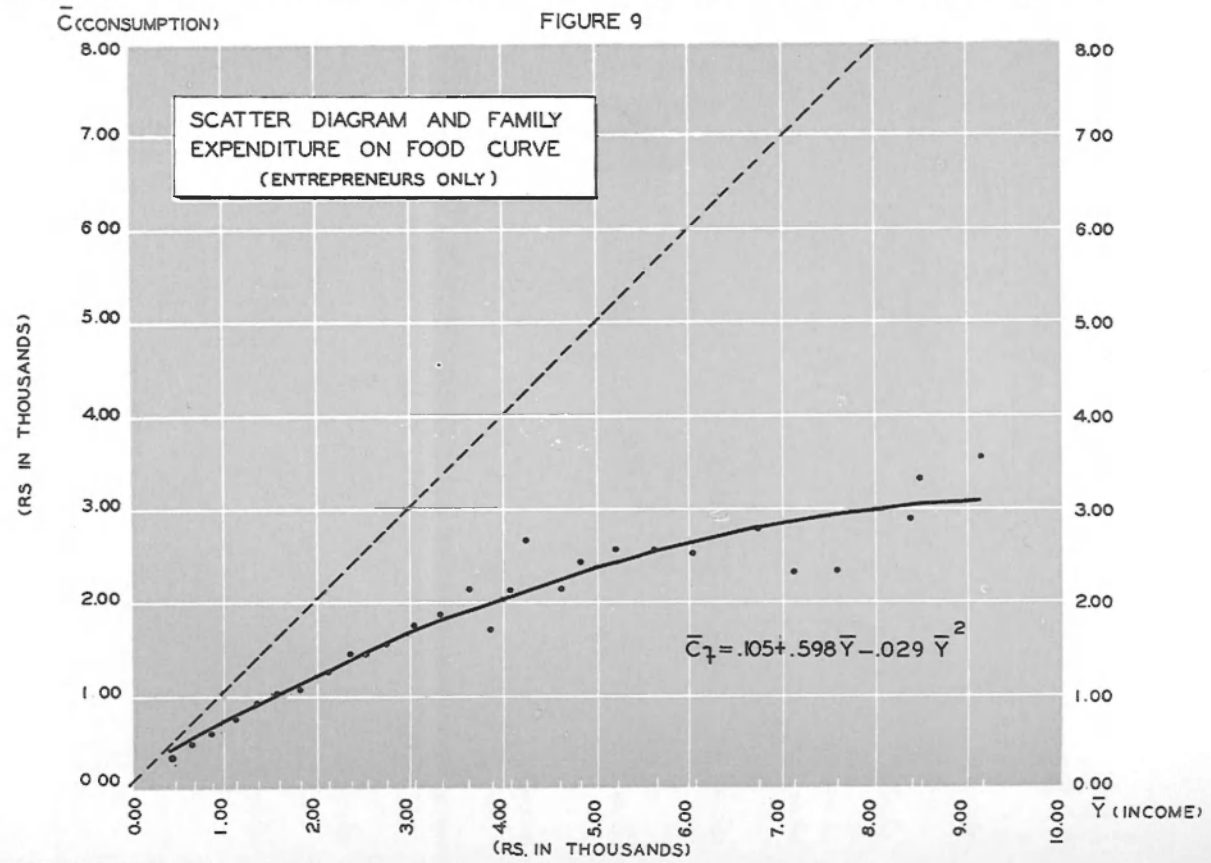
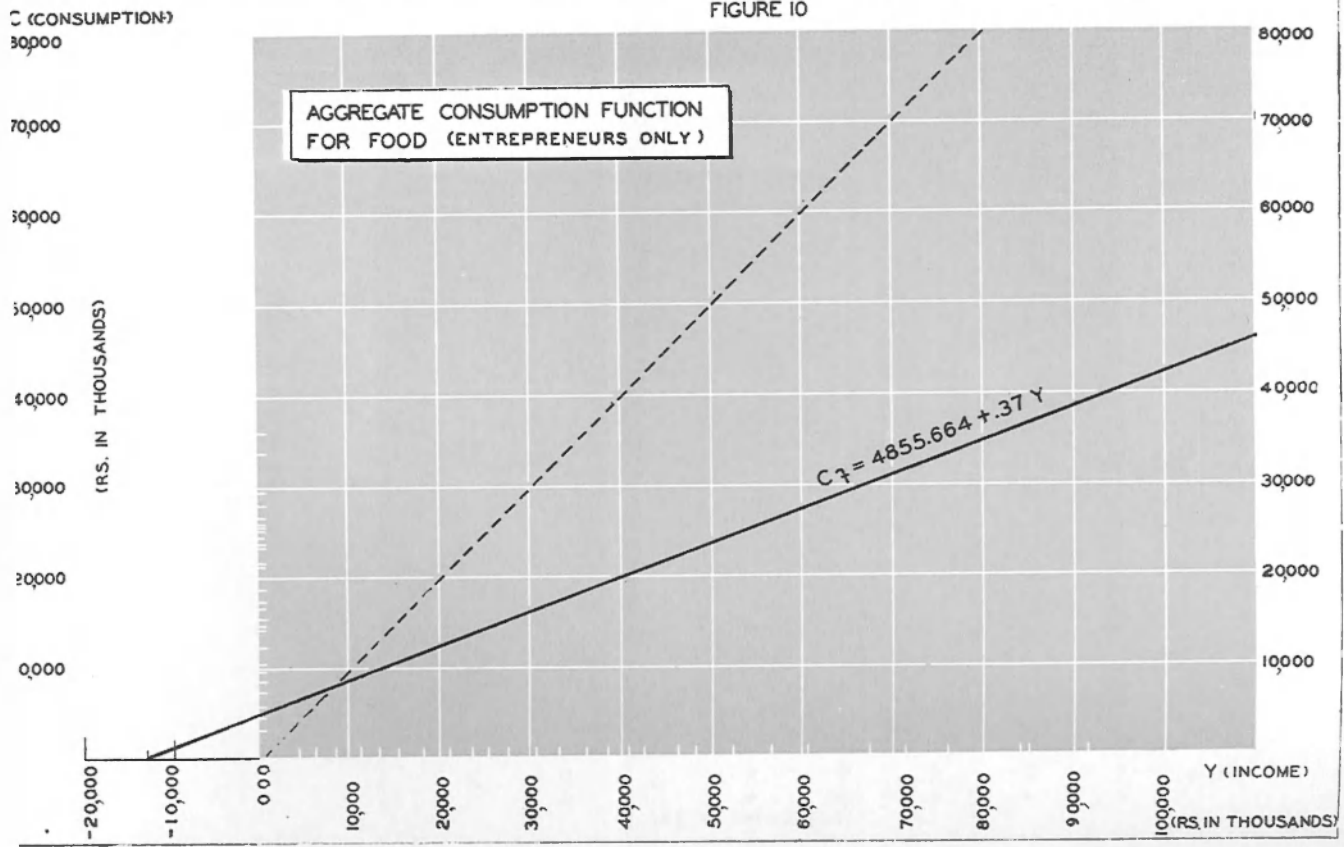
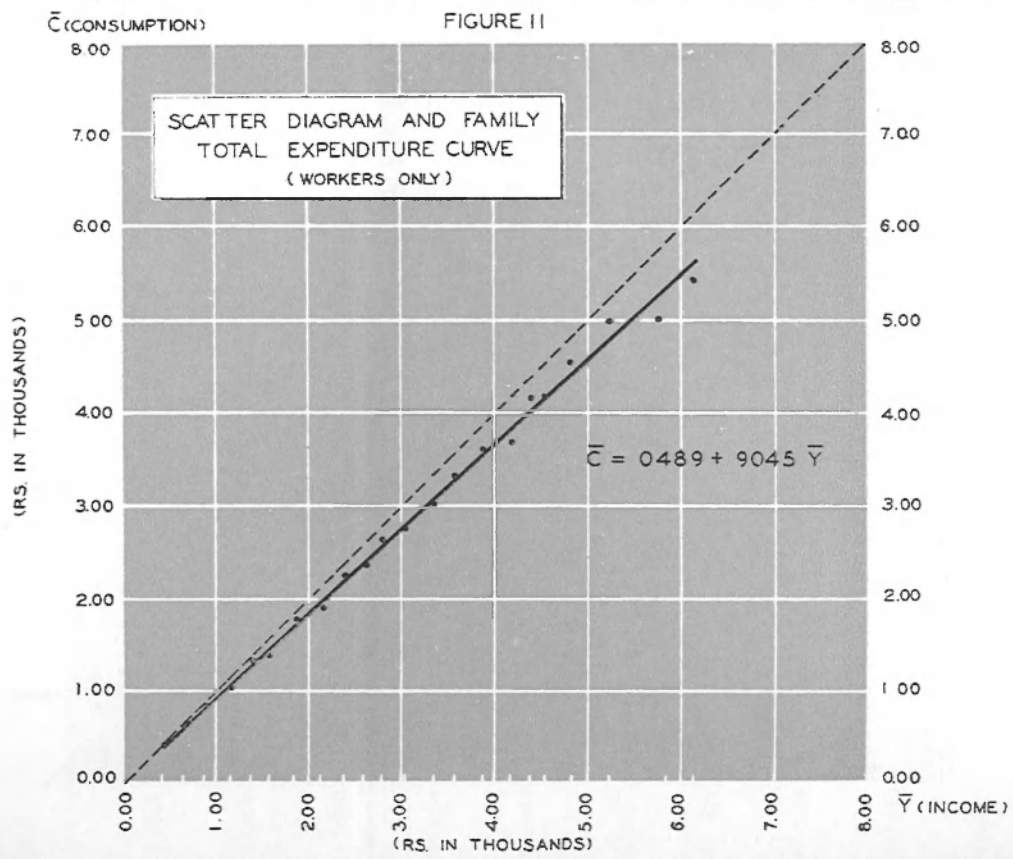
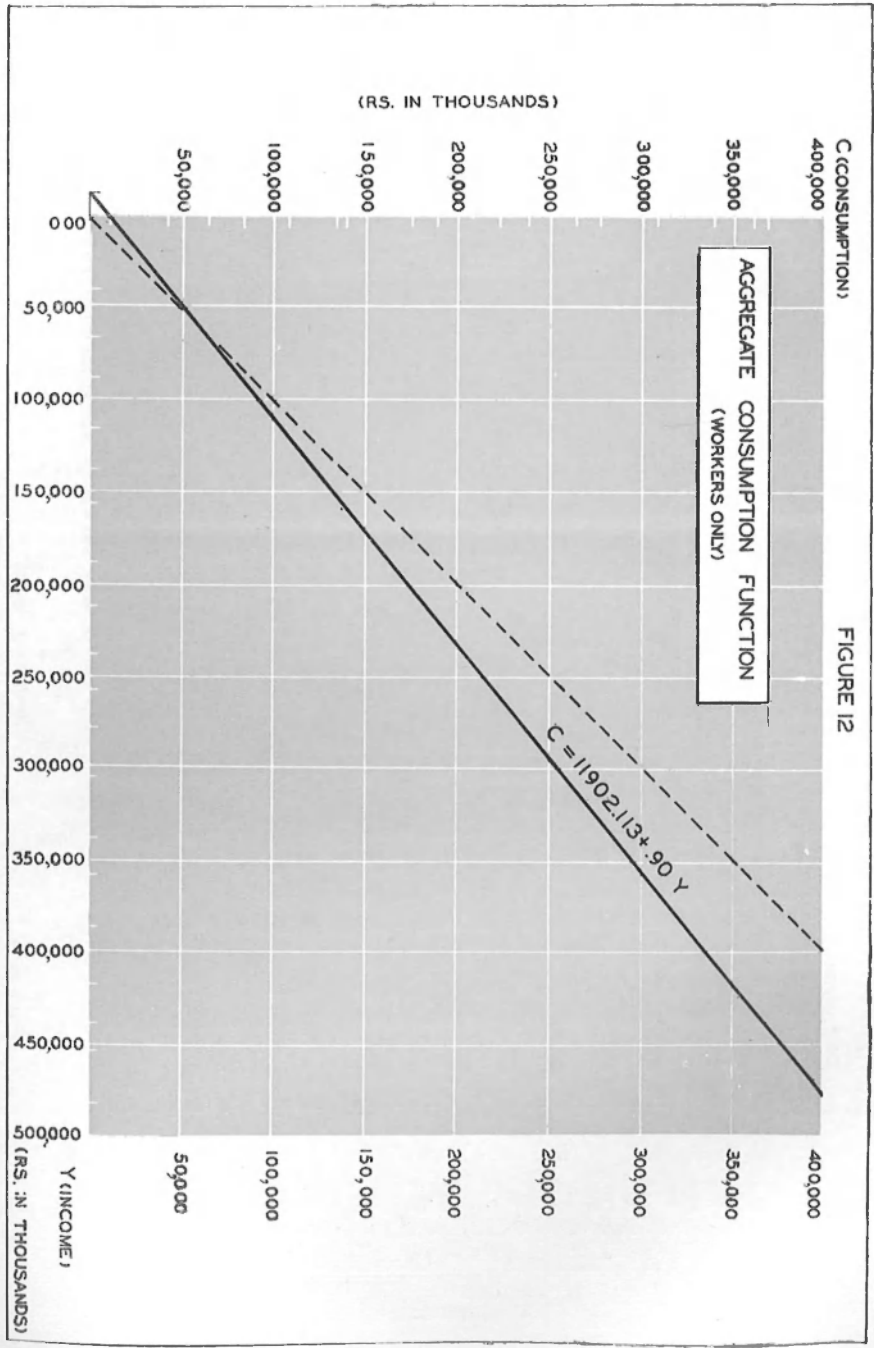


FIGURE 10

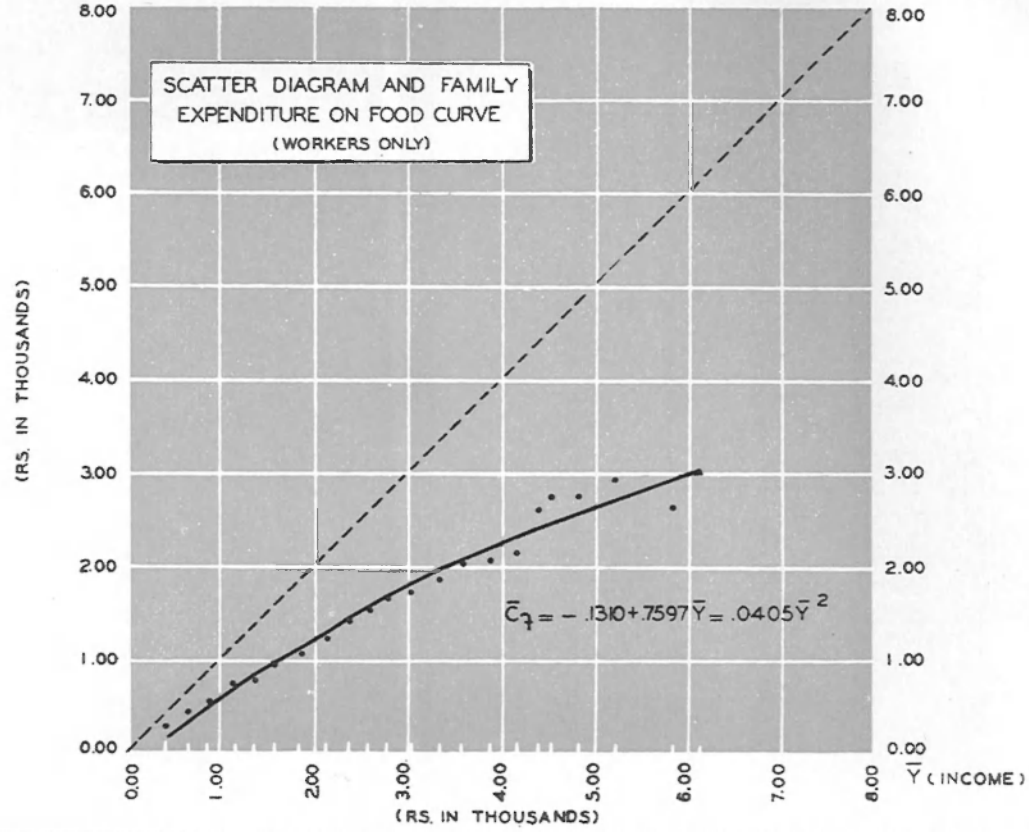






\bar{C} (CONSUMPTION)

FIGURE 13



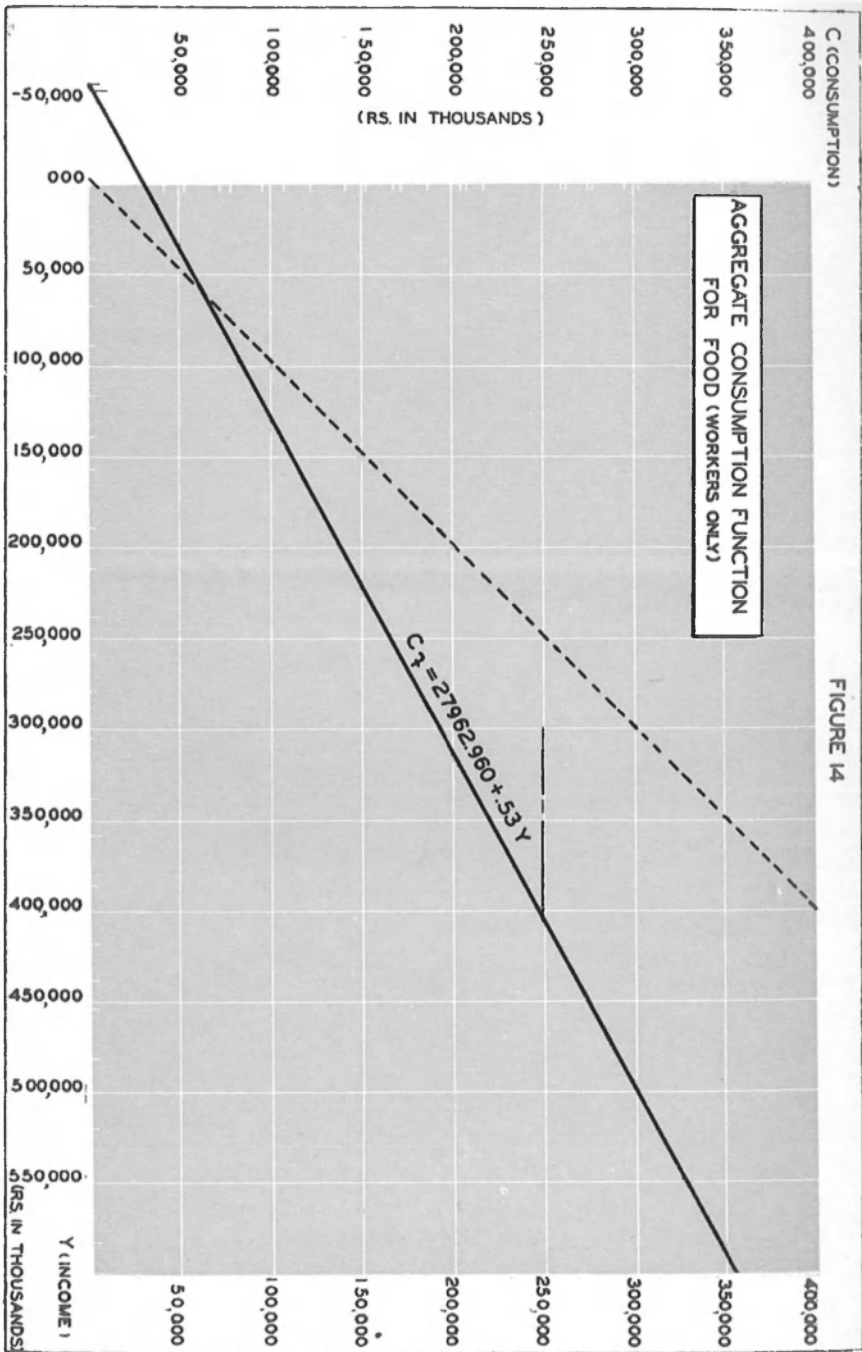


FIGURE 14

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The Institute of Development Economics publishes results of its research activities in the form of monographs. These and other publications of the Institute may be obtained on application addressed to the Joint Director.

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The Pakistan Development Review Editor: *Dr. Henry J. Bruton*

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*By Dr. J.C.H. Fei and
Dr. G. Ranis*

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Models to Economic Planning in Pakistan

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tion

By Dr. G. Ranis

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A. H. Siddiqui

Report on the Seminar on Industrialization and Labour Manage-
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Editor: *M.L. Qureshi*

A Summary of Selected Studies on Family Planning in Under-
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By W.P. Mauldin

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Reference to Pakistan (Price Rs. 10.00)

Editor: *M.L. Qureshi*

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